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The Study of the Phenomenon of Creativity in the Educational Environment

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Abstract

The modern world has changed dramatically: now it is the world of increasing volatility, heterogeneity, diversity, and rapid changes. It has become a self-organizing system that goes out of a human control and imposes its own laws. The state of a managed object has varied, whereas the methods of learning and management remain the same. The article argues that it is necessary to use new forms of training and management, based on non-linear thinking and creativity. The main purpose of the research was to investigate the attitudes towards the phenomenon of creativity in the educational environment. The article presents the results of a sociological survey of 350 teachers/professors, 680 students and 300 entrepreneurs about their attitudes to the possibility of teaching and using of creative technologies. The survey results show that the teachers/professors are rather conservative, while business people generally recognize the effectiveness of creativity in their work. The authors propose technology, techniques, software, and organizational forms of training students and schoolchildren in accordance with the requirements of the knowledge economy, which implies not only the possession of a set of necessary knowledge, but also the ability to generate and apply it in real life situations. An original intelligent IT-system for the formation and development of the individual creative thinking, as well as team skills of innovative project work of students and schoolchildren, is outlined in the paper.

Keywords: system creative thinking, knowledge economy, educational technologies, creativity management system.

1. Introduction

The problems faced by people in the twentieth century made scholars speak of the “collapse” of solutions Ralster

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& Nadler, 1998; Nadler, Hibino, & Farrel, 1999), the system crisis of culture (Hösle, 2007; Habermas, 2010; Adomo & Horkheimer, 2010), the anthropogenic crisis (Arsenyev, 1993; Semenov, 1989), the crisis of an "imperfect society" (Peccei, 1982; Giddens, 2000; Beck, 2009; Safiullin, Elshin, & Shakirova, 2012; Safiullin, Ismagilova, Safiullin, & Bagautdinova, 2012). Virtualized relationships, economic globalization, the development of information technologies are changing the speed of decision-making, the risk of running business, but they are opening up new possibilities in the use of modern technology as well. The state of a managed object has varied, whereas the methods of learning and management remain the same. We are trying to open a "new door" with "old keys" (Shevyrev, 2007). The key element of the sustainable development of society is a continuous creative development. In this situation the educational field has a mission of effective and fast training of innovators and skilled innovation explorers, to develop new forms of "intellectual industry".

The research of creativity (mainly in the context of psychological and cognitological approaches (neurolinguistics, cognitive psychology, and pragmatic models of thinking) has been actively conducted since the early 70s (de Bono, 1986; Wujec, 2002; Buzan, 2010; Dilts & Epstain, 1995). Russian scholars emphasize evolutionistic and technological interpretations of thinking: Vygotsky's cultural-historical approach (Vygotsky, 1983), evolutionary epistemology (Ruzavin, 2005), technological orientation (Yulov, 2005), Altshuller's algorithmic approach (Altshuller, 1989). Today Russia needs the synthesis of various cognitive practices within the creativity management system. Its methodology is based on the application of the technology of generating creative solutions. As opposed to linear thinking, creativity management system operates with hypotheses and paradoxes, and in contrast to lateral thinking, it aims to find a solution for a specific problem Creative management allows uniting the theory of cognitive processes and the theory of practical activities together and integrating the thinking process into the reproduction process.

2. Methodology

2.1. Design

This work is based on the method of applied sociological research. The investigation aims to study the phenomenon of creativity among teachers/professors, students and entrepreneurs, which allows monitoring empirically the current social processes, and drawing conclusions about the prospects and the need to promote creative teaching methods in each of these three groups. The researchers did not interfere with the situation, condition and variables and did not control or tamper with them; they simply studied, described and examined the results.

2.2. Sample

The statistical sample of this study is 350 professors/teachers, 680 students and 300 entrepreneurs and managers of Kazan (Russia) who were selected by using a cluster method. The cluster method of sampling is a technique which divides individuals based on their in-group characteristics into various groups. In this study, the participants were rated on the basis of their geographical location and field of activity.

2.3. Instruments

In order to estimate the statistical sample size, Chertsey and Morgan table was used. The following questionnaire has been employed to collect the data required for the purpose of the study.

The correspondents were asked to agree or disagree with the following statements and questions:

1. Is there a creativity as a phenomenon?
2. Creativity is a "God-given talent", a "gift", and one cannot develop it as a skill.
3. One can develop creativity only on his/her own.
4. Creativity is not essential for making efficient managerial decisions (consistency and logic are required).
5. Intentional task-oriented generation of creativity is impossible.
6. There are no intentional development and generation of creativity.

7. Techniques of generation and development of creativity exist, but they are ineffective.
8. The results of creative decisions are unstable and ineffective.
9. Can I (after attending a special educational course) effectively teach creativity techniques to anybody?
10. Can I efficiently apply creative techniques to my work?

2.4. Administration method

The survey was carried out after obtaining the necessary permissions from the senior students of educational sciences, who had already been trained fully. Carrying out the survey took 15 - 20 minutes (per person), and it took 25 days to analyze and interpret the results. 1330 out of 1400 questionnaires were filled in and returned, 70 forms were damaged and thus ignored. The final number of questionnaires was 1330.

3. Findings

The distribution of the number of positive responses is shown in Figure 1

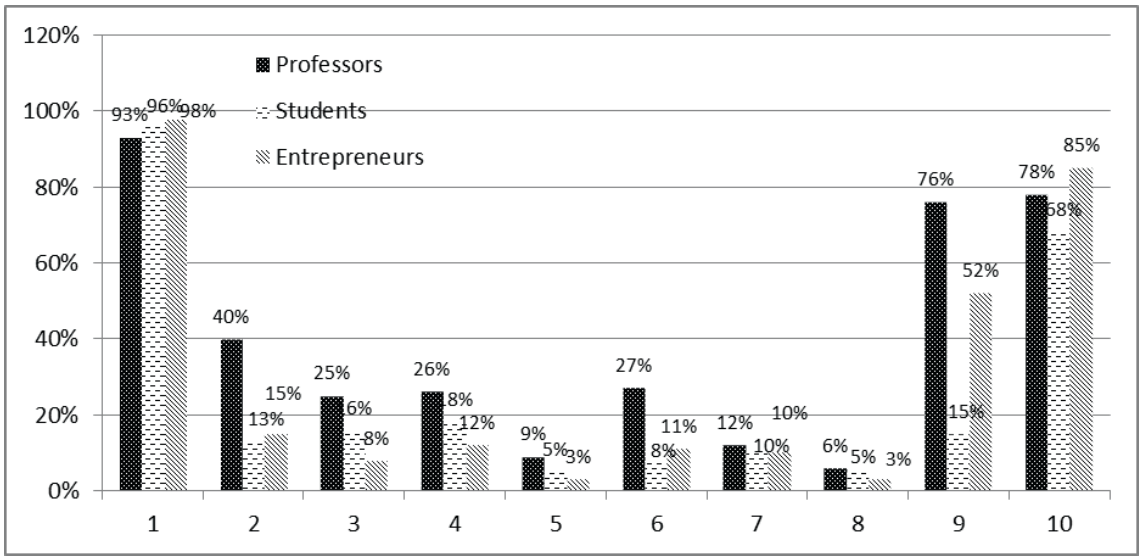

Fig.1. Percentage of positive responses of the groups of professors/teachers, students and entrepreneurs to ten statements of the questionnaire.

The chart shows that:

- Almost all the respondents recognize the existence of creativity, but the number of professors/teachers who believe in creativity is less than that among students and entrepreneurs.
- 40% of professors/teachers believe that creativity is a “God given talent”, a “gift” and one cannot develop it (question 2), whereas 76% are still willing to teach creativity techniques, after taking a special training course.
- Percent of those who believe that creativity is not necessary for making efficient decisions (question 4) and that technologies of intentional development of creativity do not exist (question 6) is twice higher among professors/teachers than among entrepreneurs.

The survey results show that teachers/professors are rather conservative, while business people generally recognize the effectiveness of creativity in their work (question 10), and, thus, it is necessary to popularize the use of creative technologies in educational field.

4. Discussion and conclusion

The authors proposed methods, techniques, software, and organizational forms (educational and professional creative command centers, studios, classrooms, workshops, etc.) of teaching technology of creativity in universities and schools. This is an efficient instrument of innovation and training students and schoolchildren in accordance with the requirements of the knowledge economy, which implies not only the possession of a set of necessary knowledge, but also the ability to generate and apply it in real life situations.

In educational process we use the original applied intelligent IT-system 'Technology of Creative Problem Solving' in order to form and develop individual system creative and innovative thinking, as well as team skills of innovative project work of students and schoolchildren. It includes five modules:

- effective team building and managing team creativity on a real-time basis;
- educational command center for team work on projects in classrooms;
- individual program for a system creative generation of solutions in any academic field of study (especially management) at universities;
- virtual workplace out-of-class (for all students to work in any academic field of study);
- program 'Strategic meeting 1.0' - a universal means of preparation, holding and implementation of the decisions made at the meetings at any organizational level.

The program works by sequentially passing the modules that make up the logic of managerial problems.

1) Input: The work of the system begins with the setting up a mode of the users' self-testing and building an effective team on the basis of special tests of Keirsey, MBTI, PAEI, etc. As a result, the system generates an effective team (teams) taking into account both psychological compatibility and team roles of participants. Moreover, it allows users to take into consideration their individual physiological characteristics.

2) Current Situation Analysis and Forecast: Further, the program, with the help of special applications, scans the current situation in the observed system, describes and represents it in a graph. The system forms a mind-map of the issue: formulates a common goal, carries out various types of analysis (FCA, PEST, SWOT), portfolio analysis (BCG, GE/McKinsey Matrix), G-marketing, financial analysis. Then, it forecasts and estimates arising problem situations or searches them if they are latent. Then, the program forms the systems of models of such situations; selects the key ones, analyzes and composes them in a unified model.

3) The Problem and Target Area Formation and the Key Goals Selection: On the basis of a common goal, a system ('network') of orienting goals is formed. In the first stage a key goal is selected and the criteria of achieving it are formulated.

4) A set of Subgoals Formation: Further, the key goal is decomposed into many subgoals from which the key subgoals (problems) are selected. Afterwards the key sub-goal is set, and the particular techniques of achieving it are determined.

5) Search for Solutions: control is transferred to the central part of the technology, which searches for solutions and ideas for implementing them into a specific decision. Work in this part of the system is carried out by using a variety of thinking techniques, which supplement each other and compete with each other. In this phase, generating, lateral and dialectical thinking, TRIZ, formal logic, etc. are applied. The problem is worked up with the help of special heuristic and logical procedures and techniques; it is reformulated, viewed from different angles, levels of differentiation, and parameters of its elements: it takes the form of an analogy, an association, a paradox; it is reduced and synthesized. All these intellectual activities are carried out in a cyclic mode with simultaneous management of the team creativity by a leading facilitator.

6) A set of Options for Solutions Formation: The solutions found in the searching process are archived in an array {optimal solutions}.

The direction of the further research depends on the type of the problem representation. PSA and AEC are two possible directions of search for solutions.

Problem solving algorithm is designed to find the solutions to the problems, which do not explicitly need the investigation and taking into consideration of social and psychological characteristics of a person or group of people

(AEC-model is used for that purpose) This type of problems include technical and technological, information, logical, macro organizational, etc. In general, the contradictions are mostly technical, physical, and managerial.

The algorithm of effective communications is designed to solve the problems related to communication interactions. AEC-model uses such effective techniques of cognitive psychology as neuro-linguistic programming and reflexive management. Contradictions are social and psychological.

7) Assessment of Options for Solutions: Further, possible solutions are consistently evaluated on the basis of the Karl Popper's theory of falsifiability (Popper, 1963) and Imre Lakatos's critical rationalism (Lakatos, 1970). Evaluation is carried out with the help of the technique of targeted destruction of the resulting solutions. It can be quantitative (economic efficiency evaluation: NPV, IRR, payback period) and qualitative (effectiveness - costs).

If the solutions are rejected after evaluation, the system attempts to correct it (module 'Options for Solutions Adjustment'). In case of repeated failures, the solution is archived despite the fact that it cannot be implemented at the moment. Successful solutions are archived in an array {acceptable solutions}.

8) Evaluation for the Presence of Feasible Solutions: If the array {acceptable solutions} contains feasible solutions of the key problem, control is transferred to the module 'Selection of the optimal solutions from the possible ones'. If the feasible solutions are not found, control is moved to the module 'Making Further Decision' where a user decides whether to continue the search for solutions or not.

9) The Selection of the Optimal Solutions from the feasible ones: Further, if feasible solutions had been found, the choice (by experts or by using optimization algorithms) of one optimal solution, or a composition of multiple solutions from the archive for future implementation is made.

10) Resource Analysis: The analysis of resources for the practical implementation of the selected optimal solutions is carried out. If there are enough resources, control is transferred to the module 'Analysis of the Set of Subgoals' to select the next key problem.

If there is the lack of resources for the selected optimal solutions implementation, control is transferred to module 'Rearrangement'. In that case the following scenarios of the users' actions are possible:

- Simplification of subgoals and (or) a key goal;
- Adding another subgoal related to the challenge of finding the missing resources to the set of subgoals;
- Turning back to the module 'Search for a Solution' in order to find a more optimal solutions in the context of resources.

11) Analysis of a Set of Subgoals: a set of subgoals is analyzed to find out if all of them are exhausted. If users achieved all the subgoals, which form a chosen key goal, they automatically move to a module 'Analysis of an Issue', otherwise - to the module 'Formation of the Set of Subgoals for Choosing the Next Subgoal (Next Key Problem)', etc.

12) Analysis of an Issue: a set of key goals (identified after analysis and forecast of a current situation) is analyzed. If the issue is settled, the control is transferred to the module 'Formation of a Complex Solution'. Otherwise, a user moves to the module 'The Problem and Target Area Formation'. This key goal is, in turn, divided into a set of subgoals. Then, the next key problem is selected from those subgoals, and the cycle of the solutions for the key problems finding is repeated again.

13) Formation of a Complex Solution: all the solutions are coordinated with the help of calendar scheduling and loading plan, which enables to organize rationally (or optimally if the modules of optimization are used) the process of implementation of a complex solution, which is related to all the key goals.

14) Output: it completes the cycle of finding solutions for a specific issue. This module includes calendar scheduling and loading plan of a complex solution implementation (in the form of an order or instruction). The NLP-procedure of connecting with the future helps users to mentally tune in the successful implementation of a plan. It is important to return to the issue to monitor it. For that purpose the point (date) of return is to be planned. In order to control the complex solution (in the form of a plan, schedule) regulatory documents are prepared.

Users again and again "storm" the problem, creating new ideas and implementing them in concrete decisions.

The program software 'Technology of creative problem solving' is unique. It allows:

- Connecting and coordinating users' (students') knowledge in various academic fields in an integrated, constantly evolving system of knowledge that helps to intensify the process of education;
- Developing and improving managerial skills, and first of all management thinking, in design and implementation of specific projects. It is important that the system takes into account individual characteristics of users' cognitive and educational needs;

- Greatly facilitating the teachers' and students' practical work in computer classes, transforming it into the research mode; making this work interesting and exciting, increasing teachers' productivity, enabling students to work independently;
- Increasing the users' "sensitivity" to problems;
- Developing users' culture of analytical work;
- Increasing the quality and intensity of studying of other disciplines by including the elements of the system creative thinking;
- Minimizing the cost of software used for training students (one integrated educational system is appropriate for a variety of academic disciplines: economic, legal, social, psychological, technical, etc.);

People have to overcome many stereotypes related to creativity. There is much to be done in studying creativity and applying the theory to practical needs. But creativity can be managed with the help of special cognitive technologies included in the software package 'Technology of Creative Problem Solving'. This gives grounds for optimism in dealing with the challenges of our time.

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